will be followed not only by others containing recently computed tables or by the republication of old tables at present very inaccessible, but by tracts dealing with interpolation, quadrature, mechanical integration, calculating machines, tabling machines, and bibliographies of memoirs, and of tables having special value to the practical computer. In regard to the present tract, giving the values of the digamma and trigamma functions, we should ourselves have been saved many weeks of work had it been in existence four years ago. Further, we believe it will be of help not only in many physical problems other than those we have had to deal with ourselves, but to the schoolmaster who grasps the urgent importance of teaching practical mathematics to the modern school boy. The table of logarithms is not the only table that a schoolboy should learn to handle. In most modern computing laboratories a table of logarithms is very rarely used—and when used it is generally one to 10 or 14 figures[1] where multiplications are necessary which exceed the range of the ordinary multiplying machine. Nowadays the schoolboy ought to be practised in computing, and this practice should run parallel with his algebraic work. He should be exercised in the use of tables which are not becoming obsolete like the smaller tables of logarithms. He comes at a fairly early stage to the summation of series and he is liable to regard certain series as unsummable because he has not approached them numerically, just as he unfortunately regards certain integrals as unintegrable, because he is not introduced at a quite early stage to graphical, mechanical and numerical methods of quadrature. The present tract covers a very wide class of numerically summable series, and we can conceive no better practice than the schoolmaster could provide for his pupils by teaching them to sum all such series by tabular aid. If the pupil be asked at the same time to compare the result obtained by summing directly 15 to 20 terms of the series set (using tables of logarithms if he likes!), he will have learnt during the process a good deal of the practical value of logarithms, of tests for convergency, of partial fractions, of interpolation and of the value of tabular aids to the computer. He will further have realised that 'proportional parts' are neither the sole nor necessarily adequate method of entering a table;—a belief not indeed infrequently found to dominate the post-graduate as well as the school boy mind and probably arising from the same limitation of experience—the very words 'mathematical tables' being treated as synonymous with the smaller tables of common and trigonometrical logarithms."

On the Construction of Tables and on Interpolation. Part I: Uni-variate Tables; Part II: Bi-variate Tables. By Karl Pearson. (Tracts for Computers, edited by K. Pearson, nos. 2, 3). Cambridge University Press, 1920. 8vo. 54 + 70 pages. Price $3\frac{3}{4} + 3\frac{3}{4}$ shillings.

Prefatory note: "These tracts do not profess to be a complete treatise on the construction of mathematical tables, still less a full mathematical treatment of interpolation. They put together some of the practical processes, which have been found of service in the Biometric Laboratory, and state some of the difficulties which have arisen in very heavy recent computations and I would draw the attention of the pure mathematician to the necessity for their solution. As far as I am aware, but I have not made a wide search of the literature, the bi-variate central difference formulae provided are novel. They are those which naturally arise, however, when we come to deal with tables of double entry in practice.

"The main doctrine insisted on is that in ordinary mathematical tables accuracy would be gained if the tabulation of first differences were replaced by the tabulation of first central differences, and that in bi-variate tables the tabulation of the two first central differences of both variates is in the bulk of cases the sole method by which the material can be reduced within the bounds of possible publication."

On pages 62–70 of Tract no. 2, there is an annotated list of fifty works and memoirs dealing with interpolation from 1624 down to the present.

Tables of the Logarithms of the Complète Γ*-function to twelve Figures.* (Tracts for Computers, edited by Karl Pearson, no. 4.) Cambridge University Press. 4to. 1921. 14 pages + portrait frontispiece of Legendre. Price $3\frac{3}{4}$ shillings.

[1] "And where in seeking the antilog. the school boy's knowledge of the process is idle!"

This table of log Γa, from $a = 1.000$ to $a = 2.000$ is a facsimile reproduction of the one given on pages 490–499, volume 2, of Legendre's *Traité des Fonctions Elliptiques*, Paris, 1825. This table was also reproduced in O. Schlömilch's *Analytische Studien*, 1848, p. 183f. A seven-figure abridgement is given in *Smithsonian Physical Tables*, seventh revised edition, 1920, pp. 62–63. A six-figure abridgment is given in B. Williamson, *Integral Calculus*,[1] 1884, p. 169. A four-figure table for $a = 1.01$ to 2.00 is given in B. O. Peirce, *A Short Table of Integrals*, 1899. There is a very brief table, for $a = 1.0$ to 1.9, on page 30 of E. Janke and F. Emde's *Funktionentafeln mit Formeln und Kurven*, 1909. A ten-figure table for $a = 1.005$ to 2.000 for intervals 0.005 is given by G. N. Watson in *Report of the . . . British Association . . . 1916*, pp. 123–124. But earlier than any of these was a table to twenty figures given in 1813 by Gauss[2] (*Werke*, vol. 3, pp. 161, 162; vol. 10_1, p. 375), for $a = 1.00$ to 2.00. Legendre's table is the only one of these referred to in the pamphlet under review.

A seven-figure table was given on pages 58–61 of *Tables for Statisticians and Biometricians* edited by K. Pearson (Cambridge University Press, 1914). It has been found however that for many purposes especially in the construction of tables of other functions, it was needful to work with at least ten figures.

A ten-place table of $10 + \int_0^x \log_{10} \Gamma(1 + t)dt$, for $x = .01$ to 1.00 for intervals 0.01, was given by G. N. Watson (l.c., p. 124).

R. C. ARCHIBALD.

Specimen Answers of College Candidates in Plane Geometry written at the Examinations in June, 1920. (Document no. 99, April 1, 1921), New York, College Entrance Examination Board, 1921. 8vo. 22 pages. Price 25 cents.

Preface: "The following specimen answers, with the accompanying general suggestions to candidates, have been prepared for publication under the editorship of the chief reader in plane geometry, with the co-operation of the other readers. The editor desires to acknowledge hereby his appreciation of the indispensable assistance of his colleagues, at the same time accepting personal responsibility for such numerous imperfections as have doubtless resulted from his failure to give full and exact expression to their convictions.

DUNHAM JACKSON."

On pages 3–6 there is a general introductory commentary: on page 7 the paper set; and on pages 8–22, three answer books, one marked 80, another 60, and the third 55. The marks for each question and the reasons therefor are indicated.

Suggestions for Students of Mathematics. Mathematics and Life Activities. (Brown University, Bulletin of the Department of Mathematics, Number one). Providence, R. I., March, 1921. 8vo. 8 pages.

Foreword: "This Bulletin is intended primarily for students taking an introductory mathematical course in college.

"A second Bulletin will set forth the facilities and opportunities offered at Brown for pursuing the study of mathematics—especially for its own sake. This will include details regarding the

[1] This table is given in C. B. Davenport, *Statistical Methods*, second edition, New York, 1904, pp. 126–127; and in W. P. Elderton, *Frequency Curves and Correlation*, London, 1906, pp. 166–167.

[2] The *Encyklopädie der mathematischen Wissenschaften*, vol. II–1, 2, 3, 1899, p. 170, incorrectly attributes this table to Nicolai. On the other hand, the table of digamma functions, attributed to Gauss in Tract no. 1, reviewed above, was *not* by him, but computed by Nicolai under Gauss's direction.